

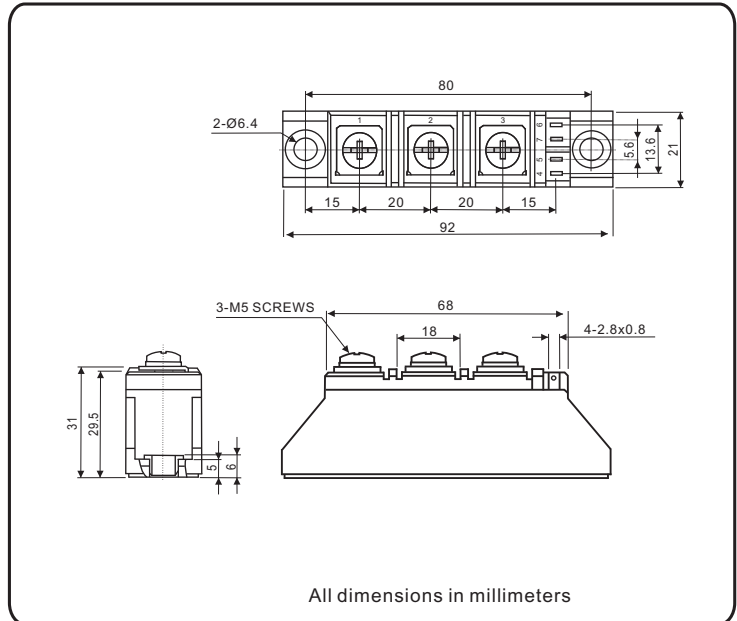
### Thyristor/Diode and Thyristor/Thyristor, 110A (ADD-A-PAK Power Modules)



ADD-A-PAK

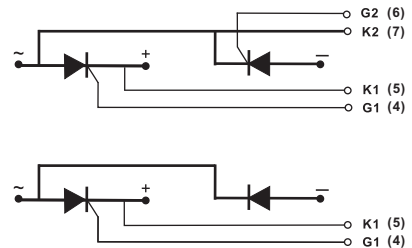
#### FEATURES

- High voltage
- Electrically isolated by DBC ceramic ( $Al_2O_3$ )
- 3000  $V_{RMS}$  isolating voltage
- Industrial standard package
- High surge capability
- Glass passivated chips
- Modules uses high voltage power thyristor/diodes in two basic configurations
- Simple mounting
- UL approved file E320098
- Compliant to RoHS
- Designed and qualified for multiple level



#### APPLICATIONS

- DC motor control and drives
- Battery charges
- Welders
- Power converters
- Lighting control
- Heat and temperature control



NKT

NKH

#### PRODUCT SUMMARY

$I_{T(AV)}$	110 A
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#### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUE	UNITS
$I_{T(AV)}$	85 °C	110	A
$I_{T(RMS)}$	85 °C	173	A
$I_{TSM}/I_{FSM}$	50 Hz	2400	
	60 Hz	2520	
$I^2t$	50 Hz	28.8	$kA^2s$
	60 Hz	26.3	
$I^2\sqrt{t}$		288	$kA^2\sqrt{s}$
$V_{DRM} / V_{RRM}$	Range	400 to 1600	V
$T_J$	Range	-40 to 125	°C

### ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS				
TYPE NUMBER	VOLTAGE CODE	$V_{RRM}/V_{DRM}$ , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	$V_{RSM}/V_{DSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}/I_{DRM}$ AT 125 °C mA
NKT110..A NKH110..A	04	400	500	12
	08	800	900	
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

FORWARD CONDUCTION							
PARAMETER	SYMBOL	TEST CONDITIONS		VALUE	UNITS		
Maximum average on-state current at case temperature	$I_{T(AV)}$	180° conduction, half sine wave ,50Hz		110	A		
				85	°C		
Maximum RMS on-state current	$I_{T(RMS)}$	180° conduction, half sine wave ,50Hz , $T_C = 85^\circ\text{C}$		173	A		
Maximum peak, one-cycle, on-state non-repetitive surge current	$I_{TSM}$	t = 10 ms	No voltage reappplied	Sine half wave, initial $T_J = T_J$ maximum	2400		
		t = 8.3 ms			2520		
Maximum $I^2t$ for fusing	$I^2t$	t = 10 ms			100% $V_{RRM}$ reappplied	28.8	kA <sup>2</sup> s
		t = 8.3 ms				26.3	
		t = 10 ms	20.2				
		t = 8.3 ms	18.4				
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reappplied		288	kA <sup>2</sup> $\sqrt{s}$		
Maximum on-state voltage drop	$V_{TM}$	$I_{TM} = 330\text{A}$ , $T_J = 25^\circ\text{C}$ , 180° conduction		1.6	V		
Maximum forward voltage drop	$V_{FM}$	$I_{FM} = 330\text{A}$ , $T_J = 25^\circ\text{C}$ , 180° conduction		1.3			
Maximum holding current	$I_H$	Anode supply = 6 V, resistive load, $T_J = 25^\circ\text{C}$		150	mA		
Maximum latching current	$I_L$	Anode supply = 6 V resistive load, $T_J = 25^\circ\text{C}$		400			

BLOCKING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak reverse and off-state leakage current	$I_{RRM}$ $I_{DRM}$	$T_J = 125^\circ\text{C}$		12	mA
RMS isolation Voltage	$V_{ISO}$	50 Hz, circuit to base, all terminals shorted		2500 (1min) 3000 (1s)	V
Critical rate of rise of off-state voltage	dV/dt	$T_J = T_J$ maximum, exponential to 67 % rated $V_{DRM}$		500	V/ $\mu\text{s}$

TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	$P_{GM}$	$t_p \leq 5 \text{ ms}$ , $T_J = T_J \text{ maximum}$		10	W
Maximum average gate power	$P_{G(AV)}$	$f = 50 \text{ Hz}$ , $T_J = T_J \text{ maximum}$		3	
Maximum peak gate current	$I_{GM}$	$t_p \leq 5 \text{ ms}$ , $T_J = T_J \text{ maximum}$		3	A
Maximum peak negative gate voltage	$-V_{GT}$			10	V
Maximum required DC gate voltage to trigger	$V_{GT}$	$T_J = 25 \text{ }^\circ\text{C}$	Anode supply = 6 V, resistive load; $R_a = 1 \Omega$	0.7~1.8	
Maximum required DC gate current to trigger	$I_{GT}$			20~150	mA
Maximum gate voltage that will not trigger	$V_{GD}$	$T_J = T_J \text{ maximum}$ , 66.7% $V_{DRM}$ applied		0.25	V
Maximum gate current that will not trigger	$I_{GD}$			10	mA
Maximum rate of rise of turned-on current	$di/dt$	$T_J = 25^\circ\text{C}$ , $I_{GM} = 1.5\text{A}$ , $t_r \leq 0.5 \mu\text{s}$		150	A/ $\mu\text{s}$

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum junction operating temperature range	$T_J$			- 40 to 125	$^\circ\text{C}$
Maximum storage temperature range	$T_{Stg}$			- 40 to 150	
Maximum thermal resistance, junction to case per junction	$R_{thJC}$	DC operation		0.25	$^\circ\text{C}/\text{W}$
Maximum thermal resistance, case to heatsink per module	$R_{thCS}$	Mounting surface, smooth, flat and greased		0.069	
Mounting torque $\pm 10 \%$	AAP to heatsink, M6 busbar to AAP, M5		A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound. Lubricated threads.	4	N.m
Approximate weight				120	g
				4.23	oz.
Case style				ADD-A-PAK	

### ORDERING INFORMATION TABLE

Device code	<b>NK</b>	<b>T</b>	<b>110</b>	<b>/</b>	<b>16</b>	<b>A</b>
	①	②	③		④	⑤

- ① - Module type
- ② - Circuit configuration
- ③ - Current rating:  $I_{T(AV)}$
- ④ - Voltage code  $\times 100 = V_{RRM}$
- ⑤ - Assembly type, "A" for soldering type

Fig.1 Peak On-state Voltage vs. Peak On-state Current

Fig.2 Max. Junction To case Thermal Impedance Vs. Time

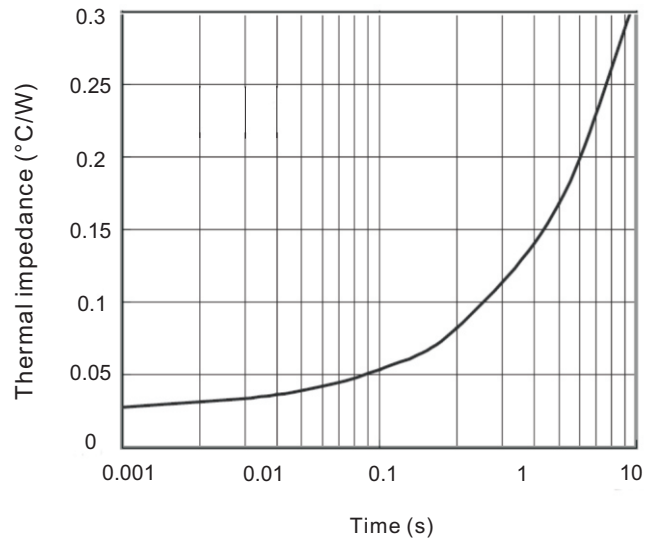
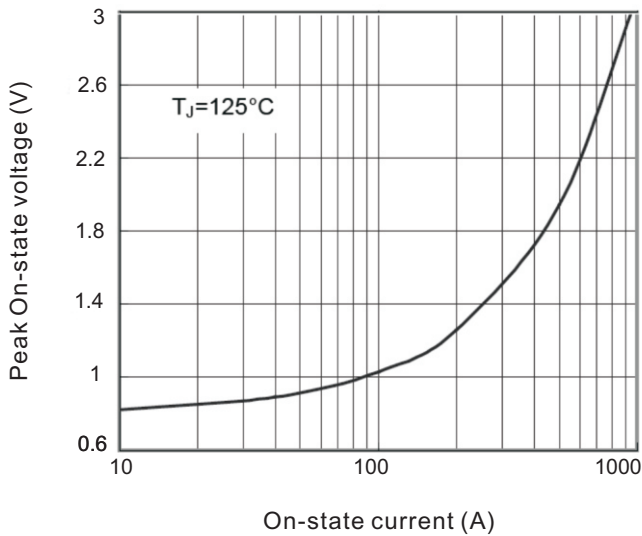


Fig.3 Power Dissipation Vs. Average On-state Current

Fig.4 Case Temperature Vs. Average On-state Current

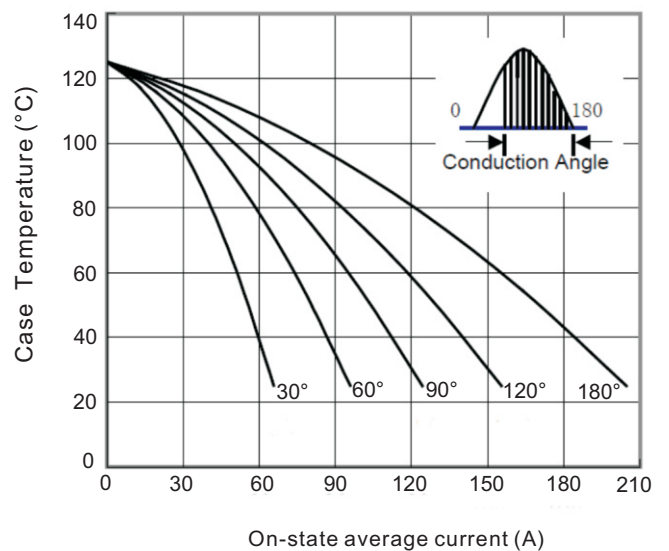
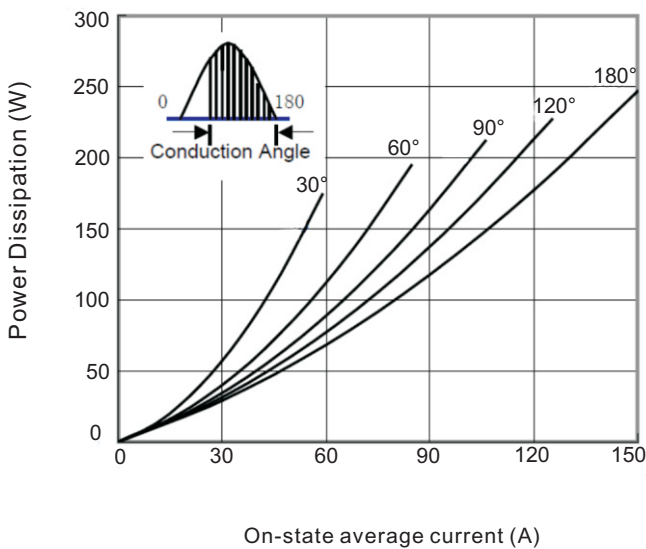


Fig.5 Surge On-state Current Vs. Cycles

Fig.6 Gate characteristics

